Warm Water Fisheries Investigations
A Prospectus for the October 25-26 Adaptive Management Workgroup Meeting

Background On August 11, 2004 the AMWG passed the following motion*: "That GCMRC and TWG make a recommendation to AMWG in October 2004 on warm water species studies including a plan starting in January 2005"*. Subsequently on September 27, 2004 the TWG passed an additional motion: *"GCMRC will develop a process, a schedule, and a recommended budget for suppression and control of non-native fish (warm water species) to be presented to AMWG at their October meeting"*. This brief is prepared in response to these two AMP directives relative to warm water species.

A significant concern relative to elevated water temperatures released from Glen Canyon Dam as a result of either low reservoir levels or TCD is the establishment or growth of non-native warm water fish populations in the Colorado River in Grand Canyon. Potential species of concern include: smallmouth bass, channel catfish, striped bass, common carp, and other centrarchids (basses) and ictalurids (catfishes). As above, the AMWG is concerned about this possibility and would like additional research into methods to detect, enumerate, capture, and possibly control these fishes.

Need In fisheries investigations in Grand Canyon, researchers utilize electrofishing, trammel nets, hoop nets, beach seines and minnow traps as fish sampling gear. We have found through 2 decades of work that these methods are fairly efficient for fish that occupy moderate to slow velocity habitats and are closely associated with shorelines. However, fish that tend to occupy higher velocity habitats or are not associated with shorelines are captured with unknown or very low efficiency using these gears. We suspect that there are several important native and non-native fish species that fall into this second category including: channel catfish, adult humpback chub, adult bluehead sucker, striped bass, smallmouth bass, and possibly adult flannelmouth sucker. In general, when we fail to catch a particular type of fish utilizing our current sampling techniques, we do not know if there are no fish there or our gear is simply not working. Alternatively, when we catch, for instance, one striped bass, we do not know if the abundance of striped bass is high or if we simply got lucky with our inefficient gear. There is a critical need to develop alternate detection, enumeration, and capture gears for both warm water non-native fishes and for native fishes in the mainstem Colorado River. This need exists both from the standpoint of a potential fish control and relative to core monitoring.

Potential Methodology There are essentially two issues to address relative to developing both a successful warm-water fish control program or a core monitoring program for both native and non-native fishes: 1) detection of the presence of particular fish species, and 2) capture of a particular fish species. Currently, the only methods we have at our disposal involve the detection of fish through capture. However, there are promising acoustic technologies to detect the presence of fish without actually capturing fish. These include various sonar systems (i.e. fish finders) and sophisticated acoustic imaging devices (e.g. Didson Camera; http://www.apl.washington.edu/programs/DIDSON/DIDSON.html). With the capability to quickly detect fish without capture, we could potentially detect, enumerate, and focus control efforts in specific river segments or habitat types. This could allow us to deploy our existing inefficient capture gear only in areas of high fish concentration. Additionally, there are alternative capture gears such as trot lines and modified electrofishing configurations that might prove much more efficient at capturing particular species of non-native fishes (e.g. channel catfish). We may also elect to utilize various radio or acoustic telemetry to better understand fish movement and use of various habitat types leading to more efficient sampling and capture methodology. Ultimately, we could employ multiple detection and capture gears in a systematic design to estimate capture efficiencies, and to determine the best methodologies for detection, enumeration, and capture for particular fish species

Potential Objectives

1) Evaluate feasibility of utilizing alternate detection, enumeration, and capture gears in the Colorado River including sonar enumeration and imaging, telemetry, modified electrofishing configurations, and angling (trot line).

2) Estimate species-specific relative capture efficiency for existing and proposed gear types.

3) Recommend methodologies and strategies for the development of a warm water fish removal program and modifications to core monitoring for mainstem resident native and non-native fishes.

Process and Schedule As a first step in the development of this program, the GCMRC would convene a workshop of potential collaborators to discuss strategies and to develop a study plan. This workshop would be hosted in January or early February, 2005. Following peer review of the study plan, we would identify a core group of collaborators, divide work assignments, secure logistics support, begin the permit application process, and purchase necessary gear. We anticipate this as a 3 year effort with two sampling trips occurring annually during June and July. Presentations would be given to the TWG during Fall 2005 and Fall 2006 reviewing first and second year progress. A final report with recommendations for the development of a warm water removal program and modifications to core monitoring for mainstem resident native and non-native fishes will be prepared and submitted for review no later than June 2007.

Potential Collaborators Ecometric Research, AZGFD, USFWS-Flagstaff AZFRO, SWCA

Preliminary Budget

Personnel	2005	2006	2007
GCMRC Staff	80	80	20
Collaborator Services	100	100	20
Logistics			
4 river trips	70	70	0
Equipment	80	40	0
Travel and Workshop	20	10	5
Total	**350**	**300**	**45**

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Warm-water Fishes Research Initiative

A Prospectus:
Presented to the Adaptive Management Work Group
October 26, 2004

Southwest Biological Science Center
Grand Canyon Monitoring and Research Center

Lew Coggins

U.S. Department of the Interior
U.S. Geological Survey

Background

- A significant concern associated with warmer water temperatures released from Glen Canyon Dam is the expansion of existing or establishment of new non-native fish species in the CRE.
  - Warming from low reservoir levels.
  - Warming From TCD

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Background

- In response to this concern, AMWG and TWG passed the following motions:
  - *"That GCMRC and TWG make a recommendation to AMWG in October 2004 on warm water species studies including a plan starting in January 2005"*
  - *"GCMRC will develop a process, a schedule, and a recommended budget for suppression and control of non-native fish (warm water species) to be presented to AMWG at their October meeting".*

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Background

- In general, the primary sampling gear that is used in the Colorado River is most efficient for fish that have the following characteristics:
  - Tend to occupy slow to moderate water velocity habitat
  - Tend to be associated with shorelines
- Trout, carp, flannelmouth sucker, small bodied non-native fishes, and juvenile fishes

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Background

- We are much less certain of sampling efficiency of our present gear types for:
  - Adult centrarchids (bass) and adult ictalurids (catfish)
  - Adult humpback chub and adult bluehead sucker

Does the occasion capture of a striped bass in a trammel net mean that there is a high abundance of STB or did we just get lucky with inefficient gear?

What does it mean when we set a trammel net in Middle Granite Gorge and fail to catch a humpback chub? No HBC present? Highly inefficient gear?

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Need

- As opposed to mechanical removal of salmonids, to develop a warm-water species removal program
  - We need basic research related how to capture warm-water non-native fishes. Evaluation of efficiencies of present and alternate capture gear.
  - We need a science based recommendation on best methodologies and strategies on how to develop a warm-water removal program.
- As identified in the draft core monitoring plan
  - We also need basic research related to capture efficiency of present sampling gear of native fishes in the mainstem.
- We believe these two needs can be accomplished simultaneously

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Potential Methodologies

- Fish Detection vs Capture
  - Currently we can only detect the presence of fish through capture
- Alternate Detection Methods and Utility
  - Hydro-acoustics (sonar, fish finders)
    - Quick detection of fish presence
    - Potential ability to enumerate
    - Potential ability to assist with maximizing efficiency of inefficient gear
    - No to little ability to determine species

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Potential Methodologies

- Alternate Detection Methods and Utility
  - Didson Camera
    - Quick detection of fish presence
    - Potential ability to enumerate
    - Potential ability to assist with maximizing efficiency of inefficient gear
    - Potential ability to determine species
    - Limited range, potential to utilize with other hydro-acoustics
    - http://www.apl.washington.edu/programs/DIDSON/DIDSON.html
    - Demo at end of presentation

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Potential Methodologies

- Alternate Capture Methods and Utility
  - Modified Electrofishing Configurations
    - Submerged anodes and ticklers
    - Demonstrated ability to capture catfish in slow water and lakes
  - Angling (long-line or trot-line)
    - Much more effective at capturing channel catfish than trammel nets
  - Pheromone Traps??
    - Under development by John Teeter, Penn State

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Potential Methodologies

- Potential Study Plan
  - Deploy detection gear, current sampling gear, alternate (test) sampling gear in systematic ways and in multiple river reaches and habitat types to estimate relative species specific capture efficiencies.
  - May also elect to conduct depletion trials with gears that demonstrate high efficiencies.
  - May also elect to fit non-native fish with radio or acoustic telemetry tags to better understand movement, habitat use, and gear efficiency.

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Potential Objectives

1. Evaluate feasibility of utilizing alternate detection, enumeration, and capture gears in the Colorado River including sonar enumeration and imaging, telemetry, modified electrofishing configurations, and angling (trot line).
2. Estimate species-specific relative capture efficiency for existing and proposed gear types.
3. Recommend methodologies and strategies for the development of a warm water fish removal program and modifications to core monitoring for mainstem resident native and non-native fishes.

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Schedule and Process

- Proposed as a GCMRC led initiative
  - Perceived need to begin soon, avoid 6-12 month delay for procurement process
- Anticipate 3 year study
- 2005
  - Host workshop in January or early February
    - Invite potential collaborators
    - Product would be a study plan
  - March
    - Develop team and assign work
  - April
    - Apply for permits
    - Secure logistics
    - Procure equipment
  - June and July
    - 2 Sampling trips, possibly below Diamond Creek

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Schedule and Process

- 2005
  - Fall
    - Brief TWG on first year findings
- 2006
  - June and July
    - 2 Sampling trips, possibly below Diamond Creek
  - Fall
    - Brief TWG on second year findings
- 2007
  - Final Report by June
  - Recommendations to develop warm-water removal program and modifications to core monitoring program

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Potential Cooperators

- Ecometric (Korman, Walters, Martell, Pine)
- AZGFD
- USFWS-AZFRO-Flagstaff
- SWCA-Flagstaff
- Tribal Nations
- John Teeter, Penn State

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Preliminary Budget Projection (x1000)

	2005	2006	2007
Personnel			
GCMRC	80	80	20
Collaborators	100	100	20
Logistics			
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Didson Camera Demo Now

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